

## Description

### Removable Tub Grip

#### BACKGROUND OF INVENTION

[0001] This invention generally relates to bathtub safety devices. More specifically, the invention relates to removable tub grips that can be secured to a bathtub to assist bathers entering and exiting the bathtub.

[0002] It is well known that entering and exiting a bathtub can be hazardous to a bather. The typical home bathroom setting often includes items made from porcelain, hard plastics, tile, and other like materials. The surfaces of such materials are known to become slippery when wet. Typically a bather has to step over a bathtub wall to enter and exit a bathtub. This causes the bather to maintain balance on one foot while the foot is located on a potentially wet and slippery surface. The challenge of entering and exiting a bathtub is exacerbated when the bather's balance is impaired due to advanced age, injury, illness or other medical condition.

[0003] One method of greatly reducing the hazards to bathers is

to provide a sturdy device for the bather to manually grasp, to assist in maintaining balance and stability, while entering and exiting a bathtub. This type of device is generally referred to as a tub grip. Nearly all bathtubs have at least one portion that is unimpeded by obstacles, such as the walls of the room, by which the bather enters and exits the bathtub. One common arrangement for providing a sturdy support is to attach such a support to an unimpeded portion of the bathtub. This provides a device that supplies stability where it is most needed and can be most conveniently utilized by the bather.

[0004] In general, there are deficiencies in existing tub grips that can be traced to the functionality and design of current devices. One such deficiency is the lack of overall strength and stability of present tub grips. The stability of current devices is undermined by the method of attachment. Attachment methods typically rely on a user's strength and dexterity to secure the tub grip to a bathtub wall. One such attachment method utilizes a threaded rod, with one end attached to a knob and the other end passing through a nut that is secured within the tub grip. The user attaches the device to the bathtub wall by manually turning or twisting the knob, which moves one or more sections of

the tub grip into contact with the bathtub wall to form an attachment. This process, and others like it, provide profound challenges to users that lack the hand strength, due to advanced age, injury, illness, or other medical condition, to perform such an operation. Any requirement above using a mild manual force to attach and detach a tub grip renders the tub grip unusable for a portion of the population.

[0005] Another deficiency in current tub grips is the limited number of times that a tub grip can be attached and detached from a bathtub wall before the device is rendered ineffective due to wear and tear of components. The numerous attachments and detachments, coupled with the relatively large forces needed to secure the tub grip to a bathtub wall, cause components to deform and fail over time. These failures erode the usefulness of the device over time.

#### **SUMMARY OF INVENTION**

[0006] The invention is for a tub grip for a bathtub that is sturdy and easy to attach and remove for those that may suffer from loss of strength and dexterity due to advanced age, injury, illness or other medical condition. In addition, the tub grip is constructed to resist wear and tear and pro-

vides its users with a substantial service life. One embodiment of the invention comprises a locking member, a first arm assembly, a clamp assembly, a second arm assembly, and, at least one locking plate. The first and the second arm assemblies and the locking plate are mounted on the locking member, whereas the clamp assembly is attached to the locking member. The locking member comprises a plurality of teeth, to which the locking plate is selectively engageable.

#### **BRIEF DESCRIPTION OF DRAWINGS**

[0007] The present invention will be more fully understood by reference to the following detailed description of the invention and the accompanying drawings. The drawings represent exemplary embodiments of the present invention and are included for illustrative purposes in order to facilitate understanding of the description. Other embodiments of the present invention contemplated by the description are included within this application to the extent they fall within the scope of the claims attached hereto.

[0008] Figure 1 is an exemplary perspective view of a tub grip.

[0009] Figure 2 is an exploded view of the tub grip in figure 1.

[0010] Figure 3 is an exemplary perspective view of the internal

configuration of tub grip.

[0011] Figure 4 is an view similar to figure 3 with the clamp lever actuated.

[0012] Figure 5 is an exemplary perspective view of relationship between locking member, locking plate, and locking plate spring.

[0013] Figure 6 is an exemplary perspective view locking plate release mechanism.

[0014] Figure 7 is an cross-sectional side view of tub grip.

[0015] Figure 8 is a cross-sectional side view detailing locking plates, locking member, locking surface, and locking plate spring.

[0016] Figure 9A is an illustrative view detailing the geometric relationship of teeth of the locking member.

#### **DETAILED DESCRIPTION**

[0017] The preferred embodiment of a tub grip 100, as shown in figure 1, includes a handle assembly 102, a first arm assembly 104, a second arm assembly 106, a clamp assembly 108, a locking member 202, a pair of locking plates 204, 206, and a locking plate release mechanism 602. So configured, the tub grip can be removably secured to a bathtub to assist bathers in entering and exiting the bath-

tub. Figure 2 shows an exploded view of the preferred embodiment.

[0018] The clamp assembly 108 is pivotally attached to an end portion of the locking member 202. The clamp assembly 108 is comprised of a clamp lever 208 and a cam 226. The first arm assembly 104 is mounted on the locking member 202, proximate to the clamp assembly 108. The first arm assembly comprises a first arm assembly housing 212, removably coupled to a pressure plate 210, and a first arm assembly pad 220 attached to the first arm assembly housing 212. The mounting of the first arm assembly is achieved by passing the locking member 202 through an aperture in the pressure plate 210.

[0019] The locking member 202 can be any structural component that has a large ratio of length of the component as compared to its height or diameter. In the preferred embodiment the member 202 has an approximately rectangular cross-section, where the cross-sectional height is substantially larger than the width. Views of the locking member of the preferred embodiment can be seen in figures 2 through 6.

[0020] The second arm assembly 106 is slidably mounted on the locking member 202. Slidably mounted refers to the lock-

ing member 202 constraining the arm 106 in two directions of movement while allowing freedom of movement in a third direction, where the third direction is along the length of the locking member 202. This configuration allows for the position of the second arm assembly 106 to be adjusted with respect to the first arm assembly 104.

[0021] The pair of locking plates 204, 206 are slidably and titlably mounted on the locking member 202. The plates 204, 206 are placed in contact with one another and located within the length of the locking member 202 that is occupied by the second arm assembly 106. Titlably mounted refers to the ability of a plate 204 to rotate a given amount, with respect to the length of the locking member 202. The plates 204, 206 are mounted by passing the locking member 202 through apertures in the locking plates 204, 206. The ability to tilt or rotate is achieved by the aperture in a plate 204 having a height that is greater than the height of the locking member 202. Although the preferred embodiment employs two locking plates 204, 206, the invention is not limited to two. The invention can utilize one locking plate or numerous locking plates.

[0022] In general, the method of securely attaching the tub grip

to a bathtub, in the preferred embodiment, relies on positioning the first arm assembly 104 in contact with one side of a bathtub wall and adjusting the position of the second arm assembly 106, by sliding the second arm assembly 106 along the locking member 202 and towards the stationary first arm assembly 104, until the second arm assembly 106 is in contact with an opposing side of the bathtub wall. Once the arm assemblies 104, 106 are in position, the tub grip applies an adequate clamping force to the bathtub wall to form a secure attachment and bear the weight of a bather entering and exiting the bathtub.

[0023] The positioning of the second arm assembly 106 can be enabled by a ratcheting mechanism. A ratcheting mechanism generally allows a component to have relative motion in only one direction, with respect to a second component. In the preferred embodiment of this invention, the ratcheting mechanism allows the second arm assembly 106 to move towards the first arm assembly 104 and resists movement away from the first arm assembly 104. In positioning the second arm assembly 106 a bather can use manual force to move the second arm assembly 106 towards the wall of the bathtub until there is sufficient clamping force to secure the tub grip 100 to the bathtub



wall. In some cases, this process may generate an attachment sufficient to support the weight of a bather entering and exiting a bathtub.

[0024] In cases where the attachment is not sufficient to support the weight of the bather the clamping force can be enhanced by the clamping assembly 108. The clamping force is enhanced when the clamping assembly 108 draws the second arm assembly 106 towards the first arm assembly 104. This is achieved when the clamp lever 208 is moved from a horizontal position to a vertical position. The clamping assembly 108 transfers rotational motion and force into linear motion and force. In addition, the lever provides a mechanical advantage to the user. A downward force placed on the lever is multiplied as it is converted to a linear force. This resultant linear force is normally greater than a force the user could manually apply directly to second arm assembly 106.

[0025] While the user positions the second arm assembly 106, the clamp lever 208 is normally in a horizontal position, as shown in Figure 3. The clamp assembly 108 is actuated by applying a downward force on the clamp lever 208, which pivots with respect to the locking member 202, and moving the lever 208 to a vertical position, as is shown in

Figure 4. The lever 208 is coupled to a cam 226, which is in contact with first arm assembly 104, via the pressure plate 210. As the clamp lever 208 is moved downward, the interaction of the cam 226 on the stationary pressure plate 210 causes the locking member 202 to move towards the clamping assembly 108. This causes the second arm assembly 106 to move towards the first arm assembly 104, which increases the clamping force and creates a more secure attachment of the tub grip 100 to the bathtub wall.

[0026] During the attachment process the clamp lever 208 is normally held in the horizontal position by a clamp spring 304. The clamp spring 304 is positioned between the pressure plate 210 and a pin stop 216 and in a state of compression. This compression applies a force on the pressure plate 210, which transfers that force to the cam 226 and urges the clamp lever 208 to remain in an horizontal position. The spring force is relatively mild and is easily overcome by the downward force applied to the end of the clamp lever 208. The configuration of the clamp spring 304, the pin stop 216, the pressure plate 210, the cam 226, and the clamp lever 208 can be seen in Figure 7.

[0027] The first arm assembly pad 220 and a pivot pad assembly

110, which is coupled to the second arm assembly 106, can play a role in creating a secure attachment in the preferred embodiment. The first arm assembly pad 220 and the pivot pad assembly 110 are positioned to be in contact with opposite sides of the bathtub wall when the tub grip 100 is attached. Both have a friction pad that resists slippage when in contact with the tub wall. In addition, the pivot pad assembly 110, which is comprised of a pivot pad 222 and a pivot pad pin 224, is pivotally coupled to the second arm assembly 106. This allows the second arm assembly 106 to maintain full contact with the tub wall, via the pivot pad 222, while the clamp assembly 108 draws the second arm assembly 106 towards the first arm assembly 104 during the attachment process.

[0028] In the preferred embodiment of the invention, the ratchet mechanism is comprised of a toothed locking member 202, two locking plates 204, 206, a locking plate spring 302 in contact with the first locking plate 204, and a locking surface 702 in contact with the second locking plate 206. The locking member 202 has a plurality of teeth configured as two series 802, 804 and located along the length of the upper and lower surfaces of the member 202, respectively. The ratcheting behavior is enabled by

the locking plates 204, 206, which serve as pawls, engaging the two series of teeth 802, 804. The locking plates 204, 206 apertures have flat upper and lower edge portions which can engage the upper and lower series of teeth 802, 804. This engagement occurs when the locking plates 204, 206 are tilted until the upper and lower edge portions come into substantial contact with the upper and lower series of teeth 802, 804. This configuration will restrict the movement of the plates 204, 206 along the length of the locking member 202 in one direction. When the locking plates 204, 206 are returned to an upright position, perpendicular to the length of the member, the upper and lower edge portions will disengage the teeth and allow the locking plates 204, 206 movement along both directions of the length of the locking member 202.

[0029] The preferred method for titling the locking plates 204, 206 is enabled by a locking plate spring 302 and a locking surface 702, as shown in detail in Figures 7 and 8. The locking plate spring 302 is mounted on the locking member and placed in contact with the first locking plate 204. The spring 302 is configured so that it is also in contact with a portion of the second arm assembly 106 and is maintained in a state of compression. The spring's 302

compression state urges the plates 204, 206 away from the spring 302. A locking surface 702, which serves as a mechanical stop, is positioned to be in contact with an upper portion the second locking plate 206. The locking surface is a portion of the second arm assembly 106. The combination of the spring force, applied at roughly the center of the first locking plate 204, and an opposing force supplied by the locking surface 702 and applied near the upper extreme of the second locking plate 206, cause the plates 204, 206 to tilt. The tilting, or rotation, will be about the line of contact between the locking surface 702 and the second locking plate 206. This tilting behavior will result in the lower portions of the plates 204, 206 moving further away from the spring than the upper portions of the plates 204, 206 and in the lower portions of the plates 204, 206 locating closer the first arm assembly 104 than is the upper portions of the plates 204, 206. The relationship of the locking plates 204, 206, locking plate spring 302, locking member 202, and locking surface 702 result in a ratcheting behavior that allows the second arm assembly 106 to move towards the first arm assembly 104 and resists movement away from the first arm assembly 104.

[0030] The ratcheting behavior is further influenced by the geometry of the teeth. A tooth generally has two edge portions, a first edge portion 902 and a second edge portion 904. The tooth and the edge portions can be distinguished by characteristic angles alpha, beta and gamma as shown in figures 8 and 9. A characteristic angle for the tooth is the angle defined by the intersection of the first edge portion 902 and the second edge portion 904 at the peak of the tooth, labeled gamma in figure 8 and 9. The characteristic angles for the edge portions 902, 904 are the angle between a line defined by an edge portion 902, 904 and a center line 906 passing through the trough or valley between two teeth. Figures 8 and 9 show the characteristic angle for the first edge portion 902 as alpha and the characteristic angle of the second edge portion 904 beta. The characteristic angles will determine how much resistance the locking plates 204, 206 provide as the ratchet is urged in the direction of allowable motion and how rigid the ratcheting mechanism is when urged in the direction that motion is restricted. In the preferred embodiment the teeth have characteristic angles of 100 degrees the first edge portions 902 have characteristic angles of 70 degrees and second edge portions 904 have

characteristic angles of 30 degrees

[0031] The invention is not limited to the use of plates with apertures mounted on a toothed locking member. There are a number of methods by which ratcheting behavior can be achieved, included, but not limited to, the use of one way gears or a spring loaded pin to engage a toothed locking member. In addition, ratcheting behavior can be achieved without the toothed locking member. One skilled in the art would immediately recognized that a variety material properties and geometries are capable of producing ratcheting behavior.

[0032] In general, the process for removing the tub grip from the wall of a bathtub relies on disengaging the locking plates 204, 206 from the locking member 202. This action is provided for by a locking plate release mechanism 602, which is shown in Figure 6. The release mechanism includes a locking plate release lever 218 and a locking plate release wire 214. The release wire 214 is attached, on one end, to the release lever 218 and coupled, on the other end, to a pair of hooks 604, 606 extending from the bottom of the locking plates 204, 206. When the lever 218 is actuated, by pulling it away from the locking plates 204, 206, the release wire 214 exerts a force on the lock-

ing plates 204, 206 and moves the plates 204, 206 towards a vertical position. The plates 204, 206 pivot about a line of contact between the second locking plate 206 and the locking surface 702. This results in the upper and lower edge portions of the aperture disengaging from the teeth of the locking member 202. The force exerted on the plates 204, 206 by the release mechanism 602 must be large enough to overcome the force that the locking plate spring 302 exerts on the first locking plate 204, which is urging the plates 204, 206 to remain in a tilted position. Once the upper and lower edge portions of the locking plate apertures are no longer in substantial contact with the teeth of the locking member 202, the second arm assembly 106 can be manually moved away from the first arm assembly 104. This releases the clamping force on the bathtub wall and allows the tub grip 100 to be removed.

[0033] In the preferred embodiment, the locking plate release lever 218 is attached to the second arm assembly 106. The release wire 214 passes through the second arm assembly 106 to couple to the locking plates 204, 206. This configuration serves to apply a force that urges the second arm assembly 106 away from the first arm assembly



104 as the user pulls on the clamp lever 208 to disengage the locking plates 204, 206. Once the second arm assembly 106 is moved away from the bathtub wall, the release lever 218 can be returned to its original position. This will cause the spring force from the locking plate spring 302 to return the locking plates 204, 206 to a tilted position, which reinstate the ratcheting behavior. Although the preferred embodiment references a release wire 204, this component can be any connector that is capable of relaying force from one component to another while in a state of tension. The preferred embodiment also utilized hooks 604, 606 on the locking plates 202, 204 to which the connector 214 can couple. The invention is not limited to such coupling. One knowledgeable in the art would immediately see numerous methods of coupling, such as, but not limited to, coupling through a pin hole or other aperture or coupling through adhesives.

[0034] The repeated attaching and detaching of the tub grip can cause wear and tear on some of the components, namely the locking member 202 and the locking plates 204, 206. Both the teeth on the locking member 202 and the upper and lower portions of the aperture in the locking plates 204, 206 could lose effectiveness if too much wear accu-

mulates. This potential issue can be addressed by constructing these components out of hardened materials, such as metals or very durable plastics. In the preferred embodiment of this invention, the materials used for the locking plates and the locking member is stainless steel.

[0035] While the present invention has been illustrated by the description of embodiments thereof, and while the embodiments have been described in considerable detail, it is not the intention of the applicants to restrict or in any way limit the scope of the appended claims to such detail. Additional advantages and modifications will readily appear to those skilled in the art. Therefore, the invention, in its broader aspects, is not limited to the specific details, the representative apparatus, and illustrative examples shown and described. Accordingly, departures may be made from such details without departing from the spirit or scope of the applicant's general inventive concept.